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Pionnotes, a synonym of *Dacrymyces* rather than *Fusarium*

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Abstract — The holotype of *Fusarium capitatum*, the type of the genus *Pionnotes*, was re-examined. Although *Pionnotes* was historically considered a synonym of *Fusarium*, it should henceforth be designated a synonym of *Dacrymyces,* with *F. capitatum* a synonym of *D. chrysospermus*. The generic name *Pionnotes* and species epithet *capitatum* should be evaluated further in future phylogenetic revisions of the *Dacrymycetales*, where most of the genera as currently understood are polyphyletic, and many common species such as *D. chrysospermus* may represent complexes of phylogenetic species.

Key words — *Hypocreales, Dacrymyces palmatus, Guepiniopsis,* taxonomy

Introduction

'Pionnotes' is an obscure term in the mycological lexicon. As a noun, it is mostly used in the taxonomy of *Fusarium* Link for colonies that have lost the discrete sporodochia that characterize the wild type. Its use as a descriptive term was probably proposed first in German by Appel & Wollenweber (1910: 28) as, "lagerartige Konidienansammlungen, die keine bestimmte Form haben und als Pionnotes mehr oder weniger ausgebreitete Schleime darstellen." By the time of the first international meeting of *Fusarium* taxonomists held at the University of Wisconsin in Madison in August 1924, pionnote was firmly established in the English terminology of *Fusarium* taxonomy (Wollenweber et al. 1925). In the modern literature, the term is still often used although, surprisingly, rarely explicitly defined (Booth 1971, Nelson et al. 1983, Gerlach & Nirenberg 1982, Burgess et al. 1994, Leslie & Summerell 2006). A pionnote is a continuous layer of slimy conidia, usually produced in culture but also sometimes in nature, essentially a broadly spreading sporodochium that lacks a fixed margin. On agar, such colonies usually lack aerial mycelium and are often considered mutants, or symptoms of cultural degeneration.

Table 1. Current status of other species attributed to *Pionnotes*, based on a review of the literature. *Fa* = *Fusicolla*. *Fm* = *Fusarium*.

Pionnotes sp.	Current classification	Reference
P. betae (Desm.) Sacc.	≡ *Fa betae* (Desm.) Bonord.	Gräfenhan et al. 2011 [lectotype K(M) 167520!]
P. biasolettiana (Corda) Sacc.	?= *Fa merismoides* (Corda) Gräfenhan et al.	Wollenweber & Reinking 1935 (as *Fusarium*)[1]
P. capillacea Sacc.	?= *Dialonectria ullevolea* Seifert & Gräfenhan	Wollenweber & Reinking 1935
P. cesatii Sacc.	?= *Elsinoe ampelina* Shear	Wollenweber & Reinking 1935 [as *Gloeosporium ampelophagum* (Pass.) Sacc.]
P. ebulliens (Fr.) Sacc.	?= *Fm avenaceum* (Fr.) Sacc.	Wollenweber & Reinking 1935
P. flava (Fr.) Sacc.	type lost, identity unknown	Schroers et al. 2008
P. flavicans Sacc. & D. Sacc.	?= *Fm graminearum* Schwabe sensu lato	Wollenweber & Reinking 1935
P. navarrae Av.-Saccá	Unknown	no subsequent treatment
P. pinastri P. Karst.	?= *Linodochium hyalinum* (Lib.) Höhn.	Wollenweber & Reinking 1935
P. polysciadis Henn.	≡ *Cercosporella polysciadis* (Henn.) Hansf.	Braun 1995 (lectotype, B!)
P. pseudonectria Speg.	?= *Microcera coccophila* Desm.	Wollenweber & Reinking 1935
P. rhizophila (Corda) Sacc.	?= *Fa merismoides*	Wollenweber & Reinking 1935
P. sanguinea (Fr.) Sacc.	?= *Fm avenaceum*	Wollenweber & Reinking 1935
P. solani-tuberosi (Desm.) Sacc.	?= *Fm solani* (Mart.) Sacc.	Wollenweber & Reinking 1935
P. uda (Berk.) Sacc.	?= *Fa merismoides*	Wollenweber & Reinking 1935 (as *Fusarium*)
P. vagans Speg.	?= *Fm sambucinum* Fuckel	Wollenweber & Reinking 1935
P. violacea Lambotte & Fautrey	?= *Fm lateritium* Nees	Wollenweber & Reinking 1935
P. viridis Lechmere	= *Fm solani* sensu lato	Wollenweber 1916 (type illus., no. 418)

[1]The synonymies of Wollenweber & Reinking (1935) are considered tentative here, unless there is an indication in the series *Fusaria autographice delineata* (Wollenweber et al. 1916, etc.) that the type was examined.

The association of this term with *Fusarium* is not a coincidence; it is derived from the generic name *Pionnotes* Fr. (Fries 1849), generally listed as a synonym of *Fusarium* (e.g., Wollenweber & Reinking 1935). The generic name itself was derived from the Greek word *piōn*, meaning 'fat', referring to the texture of such colonies in nature. The 'Wollenweber system' of *Fusarium* taxonomy, while not accepting the genus, incorporated the name into section *Eupionnotes*

for several slow-growing species that typically produce such colonies. This section continued to be used in most taxonomic treatments of *Fusarium* until its species were transferred to *Fusicolla* Bonord. and other genera by Gräfenhan et al. (2011).

The putative but unconfirmed synonymy of *Pionnotes* with *Fusarium* was based partly on the origin of the basionym of the type species as *F. capitatum* Schwein. In his first treatment of hyphomycetes, Saccardo (1886) transferred nine additional species to *Pionnotes*. Although he did not alter the generic concept, he noted that, "Verisimiliter huc ducendæ sunt et aliæ Fusarii species." An additional eight species and one variety were added to *Pionnotes* by various authors after this influential compilation. Taxa attributed to *Pionnotes* are briefly reviewed in Table 1.

This paper presents observations on the holotype of *F. capitatum*, leading to the reconsideration of the generic name *Pionnotes* presented here. The surprising result shifts this name to the *Basidiomycota*, where it will need to be considered in phylogenetic reassessments of the generic concept of *Dacrymyces* Nees. This synonymy was reported cursorily by Gräfenhan et al. (2011) and Seifert et al. (2011); the details are published and discussed here.

This is the second of a planned series of papers on the typification and nomenclature of taxa that have been attributed to or confused with *Fusarium* (Seifert & Gräfenhan 2012).

Taxonomy

Pionnotes Fr., Summa Veg. Scand. 2: 481. 1849.

Type species: *Pionnotes capitata* (Schwein.) Fr., Summa Veg. Scand. 2: 481. 1849.

≡ *Fusarium capitatum* Schwein., Trans. Amer. Philos. Soc. 4(2): 302. 1832.

type: "3032 12 Syn. Fung., Fusarium capitatum Schwein. Penns." (Schweinitz Herbarium, PH 01089966, **holotype**).

The protologue of *F. capitatum* reads:

"3032. 12. F. capitatum, L. v. S., in ligno putrido Pini canadensis prope Factory, Pennsylv.

F. sporodochiis induratis, capitato-gyroso-expansis, (ut fere Tremella) ex aurantio rubris, majusculis, subcompresso-stipitatis. Aquae immersa, omnino solvuntur in sporidia majuscula, diaphana, teretia et vermiformia aut flexuosa, apicibus obtusatis."

In proposing *Pionnotes,* Fries (1849) paraphrased Schweinitz's diagnosis, but added no details, suggesting that he probably did not see a specimen himself:

"[LVI. Pionnotes. *Fr.*

Sporae majusculae, cylindricae, flexuosae, pellucidae in massam gelatinosam rigescentem (aurantio-rubram) effiguratam junctae. Typus Fusar. capitatum *Schw.* et pl. sp. exot.]"

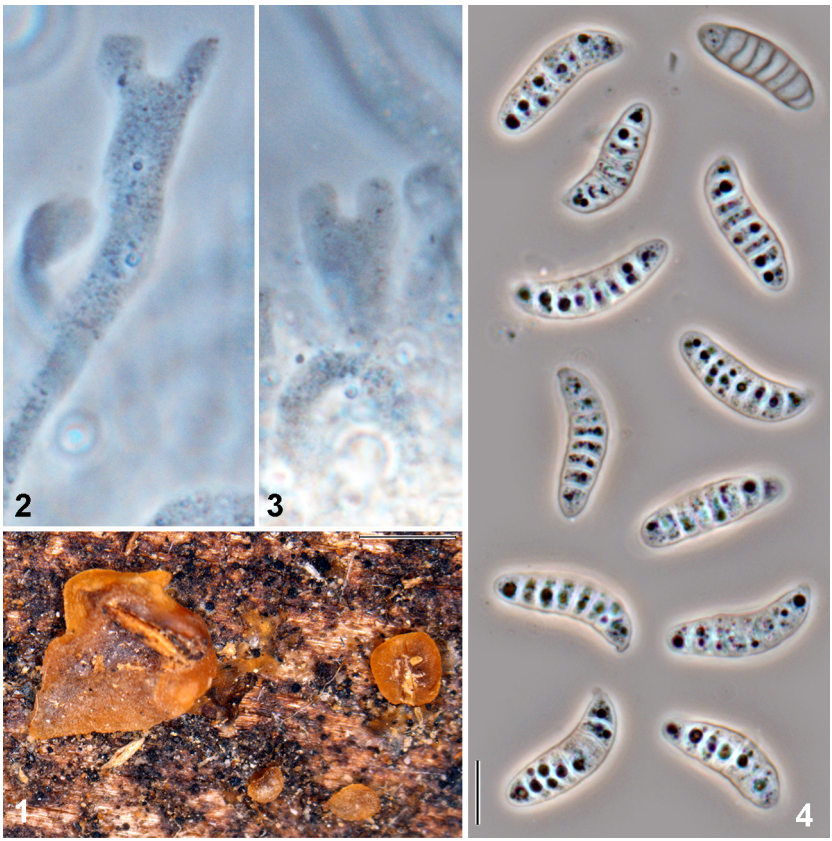
The type specimen of *F. capitatum* is a small piece of wood with several dry, hard, dark orange fruiting bodies of variable size (Fig. 1), the largest about 9 mm long and 4 mm wide. The smallest are more or less convex, but the larger are lobed and were probably originally cerebriform. When rewetted, the fruiting bodies are paler orange or yellow. Their surface is covered by what appears to be a dense hymenium with clavate probasidia that sometimes start to become bifurcate (Figs 2, 3). No mature basidia were seen. Abundant 7-septate spores (Fig. 4) cover the surfaces of the fruiting body. They are 20–25.5 × 6–7.5 µm, cylindrical to oblong and usually curved, with the most acute curvature near the base above a conspicuous papillate hilum.

The observations suggest that this is the common basidiomycete *Dacrymyces chrysospermus* Berk. & M.A. Curtis, as described by Kennedy (1956) and McNabb (1973), among others. This is a well-known species in eastern North America where the type of *F. capitatum* was collected, and it commonly grows on recently dead, fallen or cut *Tsuga canadensis*, the substrate reported by Schweinitz (as *Pinus canadensis*). When dry, the fruiting bodies of *D. chrysospermus* collapse from their hydrated, gelatinous state to hard, orange structures identical to those on the holotype of *F. capitatum*.

Discussion

Observations of the type specimen of *Fusarium capitatum* confirm that it is not a hyphomycete, but a basidiomycete identical to *Dacrymyces chrysospermus.* The taxonomic status of this epithet, and the genus it typifies, *Pionnotes*, must now be reevaluated.

In common with many classical fungal taxa, the pre-molecular generic concepts in the *Dacrymycetales* are challenged by new information. Shirouzu et al. (2007, 2009) used nuclear ribosomal large subunit (LSU) sequences to show that *Dacrymyces* as monographed by McNabb (1973) is polyphyletic. In their analyses, members of other morphologically defined genera, such as *Guepiniopsis* Pat., *Calocera* (Fr.) Fr., and *Dacryopinax* G.W. Martin, are intercalated in the *Dacrymyces* phylogeny. The clade including the type species of *Dacrymyces*, *D. stillatus* Nees, is separated from that including *D. chrysospermus* by *Guepiniopsis buccina* (Pers.) L.L. Kenn. The type species of *Guepiniopsis, G. tortus* Pat., is as yet unsequenced and the taxonomic consequences of this paraphyly are presently uncertain. Phylogenetic reevaluation of the generic concepts in the *Dacrymycetales* is forthcoming, and *Pionnotes* must now be considered as a potential name for the clade including *D. chrysospermus,* if it is to be recognized as distinct at the generic rank. Additionally, these published LSU phylogenies provide preliminary evidence for phylogenetic speciation within many morphologically defined species in this order, including *D. chrysospermus.*



Figs 1–4. *Fusarium capitatum,* holotype. 1. Basidiomata. 2, 3. Two probasidia becoming bifurcate. 4. Basidiospores (composite photograph). Scale bars: Fig. 1 = 1 mm. Fig. 4 (also 2, 3) = 10 µm.

Dacrymyces chrysospermus was known for many years, and is still often referred to in field guides, as *D. palmatus* Bres. The confusion over these two names requires some explanation. *Dacrymyces palmatus* was based on *Tremella palmata* Schwein. 1832, an illegitimate name (McNeill et al. 2012, ICN Art. 53.1) because of the earlier *Tremella palmata* Schumach. 1803. Bresadola (Höhnel 1904) transferred the epithet *palmata* to *Dacrymyces*, a nomenclatural act that legitimized it as a new name in *Dacrymyces* dating from 1904 rather than 1832 (ICN Art. 58.1). McNabb (1973) referred to both "*T. palmata* Schwein." and "*D. palmatus* (Schwein.) Bres." [sic] as "nom. nud.", his designation for what we now call illegitimate names. The next available name known to McNabb (1973) was *D. chrysospermus* Berk. & M.A. Curtis, the binomial adopted in

most subsequent academic literature. Considering the synonyms of *Dacrymyces chrysospermus* presented by McNabb (1973), *Fusarium capitatum* would be the earliest known legitimate name for this species. However, the epithet is already occupied in *Dacrymyces,* ironically by another name proposed in the same publication of Schweinitz (1832), *D. capitatus* Schwein. Thus, *F. capitatum* must be considered as a potential species epithet for phylogenetically delimited segregate species of the *D. chrysospermus* complex only if they are classified in a genus other than *Dacrymyces*.

In the absence of broader species sampling and multigene phylogenies for the *Dacrymycetales*, name changes would be premature and none are proposed here. Indeed, the long association of *Pionnotes* with the *Fusarium* literature may make it more prudent to reject this genus name as a potential source of error in interpreting historical literature, in the spirit of ICN Art. 57.1. This decision should be left to the taxonomic practitioners working with the *Dacrymycetales* or the mycologists now considering the creation of lists of protected or rejected names for inclusion in future Codes. This paper will serve its purpose by bringing these possibilities to their attention.

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Literature cited

Appel O, Wollenweber HW. 1910. Grundlagen einer Monographie der Gattung *Fusarium* (Link). Arbeiten aus der Kaiserlichen anstalt für Land- und Forstwirtschaft 8: 1–207.

Booth C. 1971. The genus *Fusarium*. Commonwealth Mycological Institute, Kew. 237 p.

Braun U. 1995. A monograph of *Cercosporella, Ramularia* and allied genera (phytopathogenic hyphomycetes). Vol. 1. IHW-Verlag, Eching bei München. 333 p.

Burgess LW, Summerell BA, Bullock S, Gott KP, Backhouse D. 1994. Laboratory manual for *Fusarium* research. 3rd ed. University of Sydney/Royal Botanic Gardens, Sydney, Australia. 134 p.

Fries EM. 1849. Summa vegetabilium Scandinaviae. Sectio posterior. pp. 259–572. Typographia Academica, Uppsala.

Gerlach W, Nirenberg HI. 1982. The genus *Fusarium* – a pictorial atlas. Mitteilungen aus der biologischen Bundesanstalt für Land- und Forstwirtschaft Berlin-Dahlem, 209: 1–406.

Gräfenhan T, Schroers H-J, Nirenberg HI, Seifert KA. 2011. An overview of the taxonomy, phylogeny, and typification of nectriaceous fungi in *Cosmospora, Acremonium, Fusarium, Stilbella*, and *Volutella*. Studies in Mycology 68: 79–113. http://dx.doi.org/10.3114/sim.2011.68.04

Höhnel, F. von. 1904. Mykologisches. Österreichische botanische Zeitschrift 54: 425–439. http://dx.doi.org/10.1007/BF01794052

Kennedy LL. 1956. *Dacrymyces palmatus*. Mycologia 48: 311–319. http://dx.doi.org/10.2307/3755479

Leslie JF, Summerell BA. 2006. The *Fusarium* laboratory manual. Blackwell Publishing, Ames, Iowa. 388 p.

McNabb RFR. 1973. Taxonomic studies in the *Dacrymycetaceae* VIII. *Dacrymyces* Nees ex Fries. New Zealand Journal of Botany 11: 461–524. http://dx.doi.org/10.1080/0028825X.1973.10430296

McNeill J, Barrie FR, Buck WR, Demoulin V, Greuter W, Hawksworth DL, Herendeen PS, Knapp S, Marhold K, Prado J, Prud'homme van Reine WF, Smith GF, Wiersema JH, Turland NJ. 2012. International code of nomenclature for algae, fungi, and plants (Melbourne Code). Regnum Vegetabile 154: 1–240. A.R.G. Gantner Verlag KG. http://www.iapt-taxon.org/nomen/main.php

Nelson PE, Toussoun TA, Marasas WFO. 1983. *Fusarium* species, an illustrated manual for identification. Pennsylvania State Univ. Press, University Park, London. 193 p.

Saccardo PA. 1886. Sylloge fungorum omnium hucusque cognitorum, vol. 4. Published by the author, Padova. 807 p.

Schroers H-J, O'Donnell K, Lamprecht SC, Kammeye PL, Johnson S, Sutton DA, Rinaldi MG, Geiser DM, Summerbell RC. 2008. Taxonomy and phylogeny of the *Fusarium dimerum* species group. Mycologia 101: 44–70. http://dx.doi.org/10.3852/08-002

Schweinitz LD von. 1832. Synopsis fungorum in America boreali media degentium. Transactions of the American Philosophical Society 4: 141–316. http://dx.doi.org/10.2307/ 1004834

Seifert KA, Gräfenhan T. 2012. Lectotypification and characterization of the natural phenotype of *Fusarium bactridioides*. Mycotaxon 120: 415–422. http://dx.doi.org/10.5248/120.415

Seifert KA, Morgan-Jones G, Gams W, Kendrick B. 2011. The genera of hyphomycetes. CBS Biodiversity Series no. 9: 1–997.

Shirouzu T, Hirose D, Tokumasu S. 2007. Sequence analysis of the 28S gene D1/D2 region suggests *Dacrymyces* (*Heterobasidiomycetes, Dacrymycetales*) is polyphyletic. Mycoscience 48: 388–394. http://dx.doi.org/10.1007/s10267-007-0378-0

Shirouzu T, Hirose D, Tokumasu S. 2009. Taxonomic studies of Japanese *Dacrymycetes.* Persoonia 23: 16–34. http://dx.doi.org/10.3767/003158509X468443

Wollenweber HW. 1916. Fusaria autographice delineata [1]: nos 1–509. Self published, Berlin.

Wollenweber HW, Reinking OA. 1935. Die Fusarien, ihre Beschreibung, Schadwirkung und Bekämpfung. Paul Parey, Berlin. 355 p.

Wollenweber HW, Sherbakoff CD, Reinking OA, Johann H, Bailey AA. 1925. Fundamentals for taxonomic studies of *Fusarium*. Journal of Agricultural Research 30: 833–843.